

## TITLE OF INVENTION

### METAL TANK COUPLED WITH A SYNTHETIC RESIN SHEET MATERIAL, AND UNIT PANEL FOR THE SAME

## TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a metal tank coupled with a synthetic material, in particular to a metal tank coupled with a synthetic resin sheet material and a unit panel for it, in which the metal tank is constructed by engaging with a plurality of unit elements in correspondence with the connected to provide a desired volume, each of which is fabricated by attaching a polyethylene sheet, which is harmless to the human body, on a portion of one surface of a galvanized iron plate, and filling a urethane resin between the other surface of the galvanized iron plate and a metal plate, thereby ensuring excellence in providing excellent cost competitiveness and waterproof property and durability while being harmless to the human body.

## BACKGROUND ART OF THE INVENTION

[0002] In general, a rubber lining is good in chemical-resistant property, wear resistant property, high adhesion property, high reliability, and high construction property, as well as economic anti-erosion processing, and is easy to-in repair and for maintenance of the defect portions during the-use, in comparison with the other organic and inorganic anti-erosion materials, so that and it occupies a unique an important position in the field of the anti-erosion processing and over whole industrious field in a wide variety of industries in spite of the conspicuous development of the plastic industries.

[0003] Conventionally, a the rubber lining technology is one of the anti-erosion technologies about the several used to protect a structure from various

chemicals including the sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), and the other harmful gases, which reduce the durability of the an iron reinforced concrete and the other structures, and is one of the high-tech anti-erosion methods applied applicable to the facilities for preventing the air pollution, facilities for processing the waste waters, the water processing facilities, and the other chemical facilities. Especially, many the water-purifying tanks employs often employ the rubber lining technology to carry out the a water-proof processing in the inside of it the tank.

[0004] Here, the rubber lining technology is divided into two types, one of which the first type is to form by way of forming a desired thickness of thick films on in the inside wall surface of the a water purifying tank by spraying the a synthetic resin, and the other type is to attach the by way of attaching a synthetic resin sheet in the inside surface of the tank.

[0005] In general, the a water-purifying tank can be divided into a concrete structure type, which is excellence excellent in construction property and cost competitiveness, and a metal water purifying tank type.

[0006] In the case of the water purifying tank made of the concrete structure, while water-proof structure is accomplished by carrying out applying a paint after constructing a mortar mixed with a water proof solution at the inside wall surface of the concrete tank, however, cracks can be produced due to the repeated expansion and contraction of the concrete so that, and a rubber lining is requisitely required to reduce water leakage. Also, in such a concrete structure type water-purifying tank, the rubber lining should periodically be repaired and conserved maintained by a predetermined period due to its particular repeated expansion and contraction.

[0007] In Further, in the case of the water purifying tank made of the metal material, a rubber lining is not constructed required in the inside of the tank

~~without except at the ceiling surface in which the where a chloride can be remained, as and it uses a harmless stainless steel. However, in such a water purifying tank constructed of the stainless steel, it is not cost competent effective because the cost of the stainless material for the tank is high.~~

**[0008]** In addition, such a water purifying tank made of the stainless steel is to be provided with a plurality of separate reinforcement angles to reinforce the side portions at the inside and the corner ~~areas portion to thereby increase, and thus, results in increasing~~ the production cost as well as the complexity of the use, while also making it difficult to use, clean and wash due to the reinforcement angle members.

**[0009]** In order to solve such problems, in Korean Utility Model Registration No. 1,358,000 (Reg. Res. date: 1998. 11. 06), ~~there is disclosed~~ a large water tank made of the synthetic resin materials was suggested. In this invention, the large tank made of the synthetic resin materials ~~has been~~ was suggested to be manufactured by spraying the polyethylene resin at the inside wall of the ~~of~~ the tank made of the synthetic resin materials, so that the structural defects of the concrete structure can be solved and it has a cost competitiveness in comparison with the water purifying tank made of the stainless steel structure, however, structure. However, it is very low in durability against the outer an external force in comparison with the concrete structure and the water purifying tank made of the stainless steel structure. Especially, as for the large or mid scale tank with a big static load or big dynamic load, it has been is required that a special particular reinforcement technology be applied to the inside and outside of the tank.

**[00010]** Another technology to solve such problems is a SMC (Sheet Molding Compound) tank, in which resin coating is applied to the metal plate made of the stainless steel or steel. Such technology is excellence excellent in

the hygiene property and earthquake resistant property, however, it is low in cost competitiveness not cost effective because a special mold is required.

[00011] Accordingly, the structure of the present water purifying tank is urgently required that it is excellence excellent in cost competitiveness as is like the concrete structure type, and is harmless to the human body as is like the stainless steel type, as well as of while also providing a structure not requiring the a frequent repair and conservation maintenance.

#### DISCLOSURE SUMMARY OF THE INVENTION

##### Technical Problem

[00012] The present invention has been made to solve the above-mentioned problems occurring in the conventional art, and the object of the present invention is to provide a metal tank coupled with [[e]] a synthetic resin, which is excellence excellent in cost competitiveness, waterproof function, and durability as well as is harmless to the human body.

[00013] Another object of the present invention is to provide a unitary panel coupled with a synthetic resin and a metal tank with such a panel, which is provided with an engagement member having and has an enhanced thermal insulation property and durability.

##### Technical Solution

[00014] To accomplish the above objects, according to one aspect of the present invention, there is provided a metal tank coupled with a synthetic resin sheet material, which includes having a tank body made of a metal material, an inlet pipe and an overflow pipe communicating with an upper portion of the tank body respectively, an outlet pipe and a drain pipe communicating respectively with a lower portion of the tank body, and a ladder installed at an outer wall of the

tank body, the metal tank is characterized by comprising: the tank body constructed of a plurality of ~~a first~~ first unit panels installed to form a bottom surface of the tank body, each of the first unit panels being made by stacking a synthetic resin sheet, a first metal plate, and a thermal insulation material in the order, and a plurality of second unit panels installed to correspond to edges of the first unit panels and to form side surfaces ~~and an~~ and upper surfaces of the tank body, each of the second unit panels being made by stacking the synthetic resin sheet, the first metal plate, the thermal insulation material, and a second metal plate in ~~order; the~~ order. The metal tank is further characterized by including: a plurality of stay reinforcement members, ~~respective both ends of which are a first end of each stay reinforcement member~~ installed at edges of the first unit panels forming the bottom surface of the tank body and a second end of each stay reinforcement member installed at corresponding edges of the second unit panels constituting forming a ceiling surface of the tank body; a plurality of beam reinforcement members, ~~respective both ends of which are first and second ends of each beam reinforcement member~~ installed at opposing corresponding edges of the second unit panels constituting forming the opposing side surfaces of the tank body, each of the respective beam reinforcement members being at least partially welded to the respective its corresponding stay reinforcement member; and securing means provided to secure the corresponding edges of the adjacent unit panels to the ~~from~~ outside wall of the tank body; wherein the synthetic resin sheet is made of a polyethylene, and the first metal plate, the thermal insulation material, and the second metal plate are respectively made of a galvanized iron plate, a foamed urethane, and a painted color steel plate.

[00015] Preferably, the securing means may comprise: ~~an~~ first and second engaging reinforcement plates, each arranged at corners of the adjacent unit panels; a securing screw for penetrating and securing ~~one side surface of the first~~ engaging reinforcement plate, each of the adjacent unit panels; ~~and, and the~~

~~other side surface of the second engaging reinforcement plate in the order; and a nut secured at an end of the securing screw.~~

[00016] According to another aspect of the present invention, there is provided a unit panel with a synthetic resin sheet material comprising: an upper surface plate portion; side surface plates plate portions, each of which is bent extending vertically from side edges of the upper surface plate portion and formed with having a plurality of securing holes; and at least one tubular securing engagement member provided to penetrate each coupled in a through-hole of the upper surface plate portion and with so that an upper portion surface and a lower portion surface are externally exposed; wherein the unit panel plate is consisted of the further characterized by a first metal plate made of a painted color steel plate, a thermal insulation material made of a foamed urethane provided at one side disposed on an upper surface of the first metal plate, and a foamed polyethylene synthetic resin sheet material provided at disposed on an upper surface of the thermal insulation material and at along side edges of the first metal plate so that the thermal insulation material can be arranged is provided between them the first metal plate and the foamed polyethylene synthetic resin material.

[00017] Preferably, the upper surface of the securing engagement member is hermetically sealed with the foamed polyethylene synthetic resin sheet material.

[00018] According to another aspect of the present invention, there is provided a metal tank coupled with a synthetic resin sheet material, the metal tank having a tank body made of including a metal material, an inlet pipe and an overflow pipe communicating with an upper portion of the tank body respectively, an outlet pipe and a drain pipe communicating respectively with a lower portion of the tank body, and a ladder installed at an outer wall of the tank body, the metal tank is characterized by comprising: the tank body constructed of a

plurality of a first unit panels installed to form a bottom surface of the tank body, each of the first unit panels being made by stacking having a synthetic resin sheet material, a first metal plate, and a thermal insulation material stacked in the order, and a plurality of second unit panels installed to correspond to edges of the first unit panels and to form side surfaces and an upper surfaces of the tank body, each of the second unit panels being made by stacking the having a synthetic resin sheet material, the a first metal plate, the a thermal insulation material, and a second metal plate stacked in the order[[:]].  
The metal tank further comprises: a plurality of stay reinforcement members, respective both ends of which are a first end of each stay reinforcement member installed at edges of the first unit panels forming the bottom surface of the tank body and a second end of each stay reinforcement member installed at corresponding edges of the second unit panels constituting forming a ceiling surface of the tank body; a plurality of beam reinforcement members, respective both ends of which are first and second ends of each beam reinforcement member installed at opposing corresponding edges of the second unit panels constituting forming the opposing side surfaces of the tank body, each of the respective beam reinforcement members being at least partially welded to the respective its corresponding stay reinforcement member; and securing means having an engaging reinforcement plate arranged at corners corner area of the adjacent unit panels and formed with having an engagement hole, a securing screw for penetrating installed in penetration through the engagement hole of the engaging reinforcement plate, through a through opening of a the securing tubular engagement member coupled to the adjacent unit panels, and through an engagement hole of the corresponding another reinforcement member in the order, and a nut secured at the penetrated end of the securing screw; wherein the synthetic resin sheet material is made of a foamed polyethylene, and the first metal plate, the thermal insulation material, and the second metal plate are respectively made of a galvanized iron plate, a foamed urethane, and a painted color steel plate.

## Advantageous Effects

[00019] According to the first embodiment of the present invention with the structure described above, it is possible to implement the metal tank, without using high-cost stainless steel, which is harmless to the human body and excellent in durability and waterproof property, and it is good in workability because a painted color steel plate is used ~~in for~~ the second metal plate ~~to remove, and thus, removing~~ the necessity of ~~separate melt the additional application of plating or painting thereon.~~

[00020] Also, in the present embodiment, it is possible to reduce ~~a production cost and is easy to clean the inside of the tank easily because a separate internal reinforcing work is not required, dissimilarly to unlike~~ the SMC tank or the water purifying tank made of the stainless steel.

[00021] In addition, in the present embodiment, ~~a workability is good improved because no welding work is carried out required in the inside of the tank, and it is very advantageous for making the to make a tank requiring which requires a sanitary work as is in the with a water purifying tank.~~

[00022] Further, according to another embodiment of the present invention, it is ~~not only~~ possible ~~not only~~ to improve the durability by ~~radically preventing the peeling of a peeling risk in the interface through applying foamed the foaming of the polyethylene without using the adhesives, but also to accomplish a~~ desirable thermal insulation performance by preventing the compression of the thermal insulation material by means of the engagement member.

[00023] Also, according to the embodiment of the present invention, it is possible to reduce the production cost because the first metal plate is not used in the second unit panel of the metal tank.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[00024] FIG. 1 is a partially cut perspective view of a metal tank coupled with a synthetic resin sheet material according to one embodiment of the present invention;

[00025] FIG. 2 is a cross-sectional view showing a portion of the metal tank according to the present invention;

[00026] FIGS. 3 to 6 are cross-sectional views showing [[a]] principal portions of FIG. 1;

[00027] FIG. 7 is a perspective view showing of a unit panel with a synthetic resin sheet material, to which having an engagement member is attached coupled therein, according to the second embodiment of the present invention;

[00028] FIG. 8 is a cross-sectional view of FIG. 7 taken along line VIII-VIII;

[00029] FIG. 9 is a partially taken cut-away perspective view showing of the metal tank with the unit panel of FIG. 7;

[00030] FIG. 10 is an enlarged cross-sectional view of illustrating an engagement portion of the unit panel with a reinforcement member;

[00031] FIG. 11 is a cross-sectional view showing a portion of the metal tank according to the present invention;

[00032] FIG. 12 and FIG. 13 are enlarged cross-sectional views showing the portions "A-1", and "B-1" of FIG. 10.

BEST MODE FOR CARRYING OUT DETAILED DESCRIPTION OF THE  
INVENTION

[00033] Hereinafter, the metal tank coupled with the synthetic resin sheet material, and the unit panel of the present invention will be described in detail with reference to the appended drawings.

[00034] FIG. 1 is a perspective view of a metal tank coupled with a synthetic resin sheet material according to one embodiment of the present invention, wherein a portion of the tank is cut out, and FIG. 2 is a cross-sectional view showing a portion of the metal tank according to the present invention.

[00035] Referring now to FIGS. 1 and 2, the metal tank of the present invention is configured to be installed stably on a foundation plate 300 provided above [[a]] pad portions 200 separated from each other and ~~is~~-made of concrete material.

[00036] The metal tank of the present invention comprises a tank body 10 consisted of a plurality of first unit panels 10a ~~constituting~~ forming a bottom surface, and a plurality of second unit panels 10b ~~constituting~~ forming a side surface and an upper surface of the tank body, an inlet pipe 40, an overflow pipe 60 and an air vent 80 communicating respectively with an upper portion of the tank body 10, a drain pipe 70 and an outlet pipe 50 communicating with a lower portion of the tank body 10, and also a ladder 90 is mounted at an outer surface of the second unit panel 10b for ~~use of the tank~~ operating, cleaning ~~ef~~ the inside of the tank, and repairing and conservation of maintaining the tank.

[00037] Here, the inlet pipe 40 and the air vent 80 are communicated with the upper surface of the second unit panels 10b ~~constituting~~ forming the upper surface of the tank body 10, the overflow pipe 60 is communicated with the upper

side surface of the second unit panels 10b ~~constituting forming~~ the side of the tank body 10.

[00038] The drain pipe 70 is communicated with the first unit panels 10a, and the outlet pipe 50 is communicated with the lower side surface of the second unit panels 10b ~~constituting forming~~ the side of the tank body 10.

[00039] Side edge portions ~~Edges~~ of the first and second unit panels 10a, 10b are bent outwardly, and the ~~respective~~ adjacent unit panels 10a, 10b are positioned for the bent portions be contacted with each other and be-engaged with each other by means of ~~the securing means 30 to the outward direction from the outside~~ of the tank body 10.

[00040] In the present invention, a plurality of stay and beam reinforcement members 22, 24, 26 are installed in the inside of the tank body 10 to reinforce the tank body 10. The stay reinforcement members 22 are installed between the edges of the plurality of the first unit panels 10a arranged adjacent and engaged integrally and between the edges of the second unit panels 10b arranged adjacent and engaged integrally to form a ceiling surface ~~so-in a manner such that the both ends of them can be stay reinforcement members are spaced apart from each other. The stay reinforcement members 22 are preferable to be~~ preferably installed at the corners corner areas of the unit panels 10a, 10b.

[00041] The beam reinforcement members 24, 26 are configured to ~~form reinforce the sides of the tank body 10 and are installed between the adjacent edges of the plurality of the second unit panels 10b and engaged integrally with each other and be opposed so in a manner to oppose such that both ends of them can be the beam reinforcement members are spaced apart along the sides of the tank body 10. The beam reinforcement members 24, 26 are preferable to be~~ preferably installed at the corners corner areas of the second unit panels 10b.

[00042] FIGS. 3 to 6 are cross-sectional views of the principal portions of FIG. 1.

[00043] Referring now to FIGS. 3 to 6, the metal tank of the present invention is ~~consisted of~~ constructed with the first unit panels 10a, each of which made by stacking a synthetic resin sheet 11, a first metal plate 13, and the thermal insulation material 15 in the order, and the second unit panels 10b, each of which made by stacking a synthetic resin sheet 11, a first metal plate 13, the thermal insulation material 15, and a second metal plate 17 in the order.

[00044] Here, the synthetic resin sheet material 11 is made of a polyethylene (P.E.) which is harmless to the human body, and is especially adaptable to suitable for a material for the water-purifying tank.

[00045] Also, the first metal plate 13 is made of the galvanized iron plate in place of the high-cost stainless steel conventionally used, and the second metal plate 17 is made of a colored steel plate in place of the high-cost stainless steel conventionally used, which and is not required ~~of~~ to apply separate painting, and the like, thereon.

[00046] ~~The Further,~~ the thermal insulation material 15 is made of a foam shaped urethane, which is excellent in buffer property, thermal insulation property, and earthquake resistant property.

[00047] With regard to the thickness of the constructing elements, it is preferable that they have thinner thicknesses decreasing in the order of the thermal insulation material 15, the synthetic resin sheet 11, the first metal plate 13, and the second metal plate 17.

[00048] An adhesive 12 is applied at an interface between the synthetic resin sheet material 11 and the first metal plate 13 of the first and second unit panels 10a, 10b to thereby produce complete close contacts between them.

[00049] Here, as described above, the securing means 30 engages the bent edge portions of the adjacent first and second unit panels 10a, 10b with each other at the outside of the tank body 10. The securing means 30 consists of an engaging reinforcement plate 30a ~~inserted and arranged~~ placed at the corners of the contacted unit panels 10a, 10b, an engaging screw 30b passing through ~~one side of the~~ the engaging reinforcement plate 30a, the bent edges of the unit panels 10a, 10b, and the other ~~side of the~~ side of the engaging reinforcement plate 30a, and a nut 30c is engaged at one end of the engaging screw 30b.

[00050] FIG. 7 is a perspective view showing a unit panel with a synthetic resin sheet material, to which an engagement member is attached coupled, according to the second embodiment of the present invention, and FIG. 8 is a cross-sectional view of FIG. 7 taken along line VIII-VIII. Referring to FIGS. 7 and 8, the unit panel 500 of the present invention comprises an upper plate portion 510, [[a]] side plate portions 520 formed by extending vertically bending from the rectangular side surfaces of the upper plate portion 510, and a plurality of engaging members 550 provided to pass through the upper plate portion 510.

[00051] The upper plate portion 510 is formed ~~with to have a central recess, center of which is formed to be depressed in the downward direction, and an~~ the engaging members 550 is are provided at the corners thereof.

[00052] The side plate portion 520 is formed with to have a plurality of engagement holes 532 in the longitudinal direction.

[00053] Now, referring to the structure of the unit panel 500 of the present invention, it is constructed that the synthetic resin sheet 561, the thermal insulation material 563, and the second metal plate 565 are stacked in order. The unit panel 500 is also provided coupled with a plurality of engagement members 550 of pipe tubular body shape to which pass through the upper plate portion 510.

[00054] Here, the materials of the synthetic resin sheet material 561, the thermal insulation material 563, and the second metal plate 565 are respectively a polyethylene, a foam shaped urethane, and a painted color steel plate. Especially, the synthetic resin sheet material 561 of the present invention is formed to ~~foam at~~ securely cover the upper surface of the thermal insulation material 563 and side edges of the second metal plate 565 to ~~radically protect,~~ and is able to prevent from the peeling risk, as in the previous embodiment, ~~ef~~ at the interface when using due to use of the adhesive 12 (See FIGS. 3 to 6).

[00055] The engagement member 550 is provided to radically effectively prevent the decrease of the thermal insulation property by the compression of the thermal insulation material 563 ~~at the time of the engagement of~~ when the reinforcement member 622 (624; 626) (refer to FIG. 10) is fastened with the unit panel 500 by means of the securing means 630, which will be described below. Here, the engagement member 550 is preferable to be preferably made of a metal material or a rigid body of a synthetic resin material having a good sufficient strength and hardness.

[00056] In the present invention embodiment, it is possible to minimize the waste of the metal materials to thereby reduce the production cost, because it is not required in the unit panel 500 to provide the first metal plate 13 (FIGS. 3-6) ~~stacked between the synthetic resin sheet material 11 and the thermal insulation material 15 of~~ as in the first embodiment of the present invention, owing due to the provision of the engagement member 550.

[00057] The engagement member 550 is inserted and engaged into a through-hole (not shown referenced) in the second metal plate 565 of the unit panel 550 500 of the present invention embodiment, or it is formed secured integrally with the metal plate 565 by welding an outer peripheral edge of the engagement member inserted into the through-hole.

[00058] The upper surface of the engagement member 550 of the present invention embodiment is hermetically sealed by the foamed synthetic resin sheet material 561 as shown in FIG. 8. This is because can eliminate the use of a separate water proof material which is required[[,]] if the upper surface and the lower surface are of have a completely opened penetrating structure, and is able to accomplish the water proof at the time of the reinforcement. In other words, in the present invention embodiment, as the upper surface of the engagement member 550 is hermetically sealed by the foamed synthetic resin sheet material 561, it is possible to accomplish the water-proof without using any separate water proof material at the time of construction.

[00059] Further, as shown in FIG. 8, the lower surface of the engagement member 550 is preferably open, however, it may optionally be closed according to depending on the existence of the reinforcement.

[00060] FIG. 9 is a partially taken cut-away perspective view of the metal tank coupled with the synthetic resin sheet material according to the present invention embodiment. Referring now to FIG. 9, the metal tank of the present invention has a structure that it is located stably in on the foundation plate 800 provided on the upper surface of the pad portions 700 made of the concrete material and separated from each other.

[00061] The metal tank of the present invention comprises a tank body consisted of a plurality of the first unit panels 500a constituting forming the lower surface of the tank body, and the second unit panel 500b constituting forming the side surface and the upper surface of the tank body, the inlet pipe 640, the overflow pipe 660, and the air vent 680, communicating respectively with the upper portion of the tank body 600, and the drain pipe 670 and the outlet pipe 650 communicating respectively with the lower portion of the tank body 600. In addition this regard, the ladder 690 is also provided at the outer surface of the

second unit panel 500b for the purposes of use using, cleaning the inside of the tank, and repair and conservation maintenance.

[00062] Here, the inlet pipe 640 and the air vent 680 are communicated with the upper surface of the second unit panels 500 constituting forming the upper surface of the tank body 600, and the overflow pipe 660 is communicated with the upper side surface of the second unit panels 500 constituting forming the side of the tank body 600. Also, the drain pipe 670 is communicated with the first unit panels 500a, and the outlet pipe 650 is communicated with the lower side surface of the second unit panels 500 constituting forming the side of the tank body 600.

[00063] The edges of the first and second panels 500a, 500b are bent to the outside direction (see FIG. 11), and the adjacent unit panels 500a, 500b are positioned to be closely adhered to each other at with the bent surfaces abutting each other, and they are coupled to thereby be engaged with each other in from the outside direction of the tank body 600 by the securing means 630. Also, in the present invention, a plurality of stay reinforcement members 622 and a plurality of beam reinforcement members 624, 626 are installed at the inside of the tank body 600 to reinforce the tank body 600.

[00064] The stay reinforcement members 622 are installed such that both ends of the respective reinforcement member 622 are spaced apart and support between the adjacent edges of the plurality of the first unit panels 500a arranged adjacent and engaged integrally, and between the adjacent edges of the plurality of the second unit panels 500 constituting the upper surface and arranged adjacent and engaged integrally to constitute form the ceiling surface. Here, it is preferable for that the stay reinforcement members 622 be are installed at the corners of the unit panels 500a, 500. The beam reinforcement members 624, 626 form reinforce the side surface of the tank body 600, and are installed such that both ends of them be spaced apart between the edges of the plurality of the

second unit panels 500 adjacent and opposing to each other and engaged integrally. Here, the beam reinforcement members 624, 626 are ~~preferable to be~~ preferably installed at the corners of the second unit panels 500.

[00065] FIG. 10 is an enlarged cross-sectional view of the engaging portion of the unit panel and the reinforcement member of the present ~~invention embodiment~~. Referring to FIG. 10, the present ~~invention embodiment~~ prevents the reduction of the thermal insulation property ~~radically as in the previous embodiment~~ due to the compression of the thermal insulation material 13 (refer to FIGS. 3 to 6), by providing the unit panel 500 attaching which is coupled with the engagement member 550 to prevent the unit panel 500 from being compressed ~~in the engagement between~~ when the unit panel 500 and is coupled with the corresponding respective reinforcement member 622, 624, 626 by means of the securing means 630.

[00066] ~~The~~ At first, the securing means 630 is comprised of includes an engaging reinforcement plate 630a arranged at corner of the adjacent unit panels and ~~formed with~~ having an engagement hole (~~not referenced no numeral~~), an engaging screw 630b configured to be inserted into the engagement hole of the engaging reinforcement plate 630a, and a nut 630c ~~engaged with~~ fastened to one end of the ~~penetrated~~ engaging screw 630b inserted. Here, the detailed explanation about the sectional structure and constitution of the unit panel 500 will be abridged because they ~~have been~~ were explained above in connection with FIGS. 7 and 8.

[00067] Describing with With regard to the engagement process, the engaging screw 630b passes through the engagement hole of the engaging reinforcement member 630a, the through-hole of the engagement member 550, and the engagement hole (~~not referenced no numeral~~) of the reinforcement member 622, 624 and 626 sequentially, and the penetrated end ~~can be~~ is strongly engaged fastened by the nut 630c. Here, as shown in FIG. 5 FIG. 8, with

as the upper surface of the engagement hole in the engagement member 550 be  
is hermetically sealed by the synthetic resin sheet material 561, the engaging  
screw 630b penetrates is forced to penetrate through the synthetic resin sheet  
material 561 and passes through the engagement hole of the engagement  
member 550. In this regard, the synthetic resin sheet material 561 functions as a  
packing for sealing.

[00068] The present invention is constructed such that the engagement  
member 550, which is made of the a rigid body, supports can support the unit  
panel 500 so that it is not compressed, ~~at the time of the engagement of~~ when  
the unit panel 500 and is coupled with the reinforcement members 622, 624, 626  
by means of the securing means 630. Accordingly, it is possible to prevent the  
reduction of the thermal insulation property radically due to the compression of  
the thermal insulation material 13 (refer to FIGS. 3 to 6) of as in the first  
embodiment.

[00069] Although the present embodiment only has been explained about  
above in connection with only the second unit panels 500, as the same  
explanation description can be applied to the first embodiment unit panels 500a,  
and the detailed explanation about it is abridged omitted. It is noted that  
Whereas, the only difference existed between the first and second panels 500a,  
500 is the difference in the cross-sectional structure (see refer to FIGS. 12 and  
13).

[00070] FIG. 11 is a cross-sectional view showing a portion of the metal  
tank shown in FIG. 9. FIGS. 12 and 13 are enlarged cross-sectional views of the  
portions "A-1", and "B-1".

[00071] Referring now to FIGS. 11 to 13, the metal tank of the present  
invention is consisted of constructed with the first unit panel 500a made by  
stacking a synthetic resin sheet material 561, a first metal plate 567, and a

thermal insulation material 563 in the order, and the second unit panel 500 made by stacking a synthetic resin sheet material 561, a thermal insulation material 563, and a second metal plate 565 in the order. Here, the synthetic resin sheet material 561 is made of the polyethylene (P.E.) which is harmless to the human body, and is especially adaptable suitable to the material for the water-purifying tank. Also, the first metal plate 567 is made of the galvanized iron plate in place of the high-cost stainless steel conventionally used, and the second metal plate 563 is made of a color steel plate in place of the high-cost stainless steel conventionally used as described above, which and it is not required of to apply separate paintings, and the like.

[00072] The Further, the thermal insulation material 563 is made of the foam shaped urethane, which is excellent in buffer property, thermal insulation property, and earthquake resistant property.

[00073] With regard to the thickness of the constructing elements, it is preferable that they have thinner thicknesses decreasing in the order of the thermal insulation material 563, the synthetic resin sheet material 561, the first metal plate 567, and the second metal plate 565.

#### INDUSTRIAL APPLICABILITY

[00074] As described above, the present invention relates to a metal tank coupled with a synthetic resin sheet material and a unit panel thereof, which is constructed by engaging with a plurality of unit elements in correspondence with the connected to provide a desired volume in the tank, each of which is fabricated by attaching a polyethylene sheet harmless to the human body on a portion of one surface of a galvanized iron plate and filling a urethane resin between the other surface of the galvanized iron plate and a metal plate, thereby ensuring excellence in cost competitiveness and waterproof property and durability while being harmless to the human body.

[00075] While the present invention has been described with reference to the preferred embodiments, the present invention is not restricted by the embodiments. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention. However, such variations and modifications are all pertained to the scope of the present invention.